



British Rail's P.C.M. phone link for the new

THE FIRST pulse code modulated (P.C.M.) telephone installation for British Rail has been completed by Line Communications Division, Writtle. This is the first system of the kind outside the G.P.O.

The contract was put out to tender by British Rail in 1967, and Marconi's won it with the right price and speed of delivery. A basic factor which convinced British Rail's engineers that they would get a sound system from us was the thoroughness of the production line testing at Basildon.

New methods of P.C.M. testing at Basildon were featured in the January issue of this magazine, and the importance of our systems of testing in the September issue.

The British Rail equipment was built at Basildon, was tested to the time scale laid down, and was shipped to schedule. It was installed by our engineers over a forty-six mile stretch of the London Midland Region main line from Euston to Bletchley, and the job was done on time.

The system—a digital link circuit comprising a single twenty-four channel system—is now in operation in this section of B.R.'s own private telephone network, giving a substantial increase in traffic. Previously, only one call could be passed at a time over one pair of lines; now twenty-four are passed simultaneously using a different pulse code for each call and one pair of lines for each direction of transmission.

A hunch

With a hunch that the official term 'installed to schedule' neatly buttoned up some interesting work on the forty-six miles of railway track to Bletchley we asked Hugh Thurgood of Line

Communications Division how he and his team went about the job.

'We started from Euston at the end of May,' he explained, 'and, first of all, tested the cable pairs over the entire length of the link.'

'B.R. had selected a route for us and we took over two de-loaded pairs of an existing multi-pair cable. It was laid in a concrete track-side duct and emerged at frequent intervals at tapping boxes or in relay rooms. At the points where it would be necessary for us to put in repeaters we tested for insertion loss, cross-talk, and deviations from nominal impedance.'

'There were thirty-six of these regenerator points in the link. Their average distance apart was 2,200 yards. Some of them, those near stations or sidings, were easy to get at; others were not. Either we had to walk the whole distance humping our heavy test gear or else find some other way. In the end we went by car. This method was the quickest.'

Leap-frog

Hugh Thurgood and John Carpenter, with B.R. assistants, worked with cars and ordnance maps as two teams. Leap-frogging each other from Euston to Bletchley they made their way to each repeater point cross-country from the nearest approach by road. In climbing this is called the direct method and so it is in this kind of engineering. Their route over hedge and ditch was never dull—'Mind the barbed wire here, Bill.' With a full pack of forty pounds a man—a selective measuring equipment weighs twenty-eight pounds—they scaled embankments and descended cuttings hitting the track somewhere near their objective and making their way to it along the line.

'On the fast sections the sleepers are set close

ANOTHER MARCONI FIRST

Euston terminal



John Carpenter and Hugh Thurgood making a final check of cable connections on the Watford tunnel repeater box

An approaching Midland Region train about to enter the mile-long Watford tunnel



together,' said Hugh, 'and here you trip like a fairy with little dainty steps, or you crunch along the ballast and tear your shoes to bits.

On the track

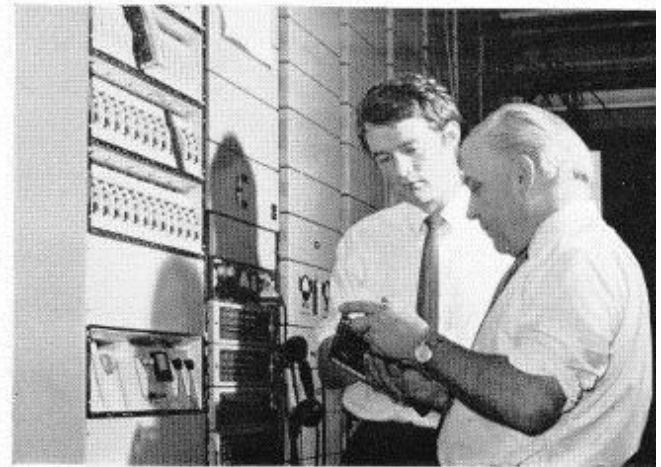
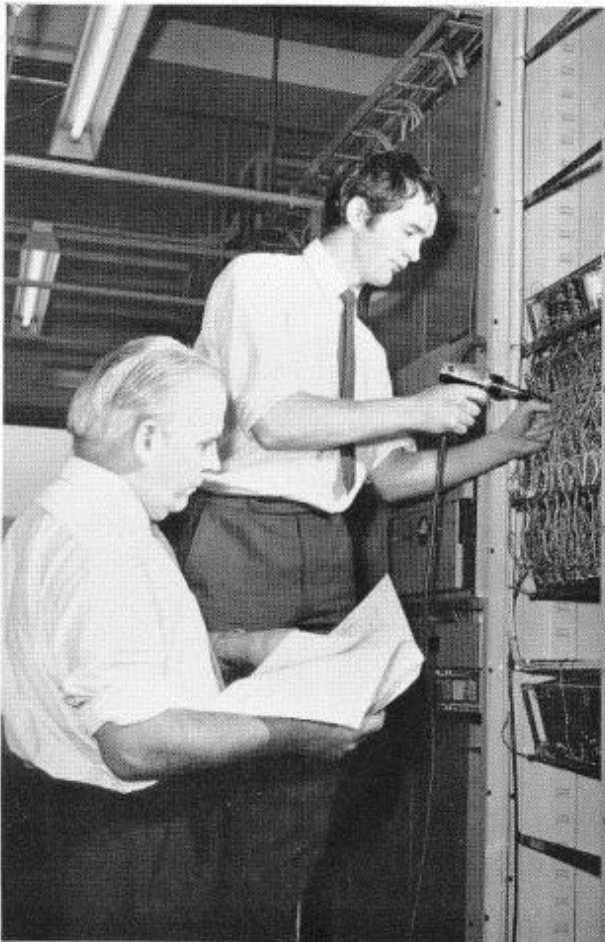
'Nevertheless, discipline on the track must be rigid. You must always plan to walk towards the backs of the signals so that you are facing oncoming traffic. Walk on the right and step right to get clear. Step left and you will be hit in the back. Trains are fast now and make little noise. If one is approaching you on a main line at 100 m.p.h. there are only three seconds left in which to take action when it is 150 yards ahead. While working at the repeater box make fast the steel doors, and when a train passes hold everything. The air blast is terrific. Heap tools on the drawings or they will get whisked away and fly like pieces of old newspaper in the wake of the last carriage.'

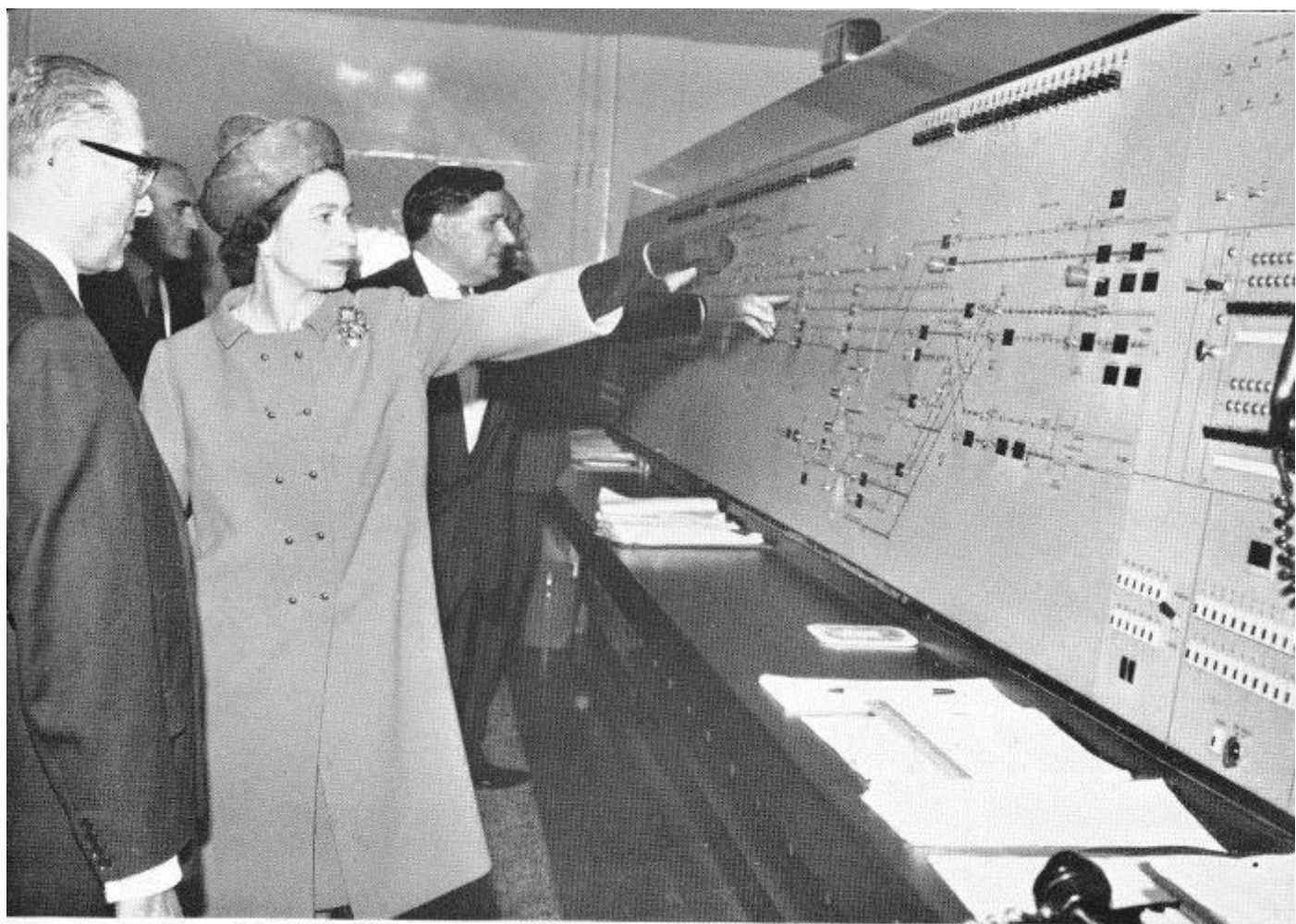
Line tests took a fortnight. During this period the terminal equipment was being completed and tested at Basildon. Then for final tests Hugh and John returned to Basildon, where they joined Eric Brigham and Peter Jennings of Writtle lab., who

were co-operating in testing all the elements of the system set up in a simulated digital link section. Meanwhile, Sid Litman and Brian Rooney were at work at the terminals, Euston, Watford, Tring and Bletchley, putting in racksides and making ready, so that when testing was finished Hugh Thurgood and John Carpenter could begin installation. This pair started at Euston on 2 July, followed closely by Sid and Brian who connected the 200-way signalling cables which provided the links between the original system and the new P.C.M. channel.

LEFT AND BELOW: Sid Litman and Brian Rooney of P.C.M. Group, Writtle, completing the terminating of the 200-way signalling and audio cable on the racksides in the power signal box at Euston

BOTTOM: The handover of the Marconi P.C.M. telephone installation to British Rail in the Euston power signal box. Left to right: Hugh Thurgood, P.C.M. Group Writtle; Paul Cheshire, British Rail Engineer; and Chris Leahy, Systems Planning Group, Writtle. The Marconi terminal is the left hand assembly, behind Paul Cheshire





With terminals complete and a tested line between them our engineers were well ahead. Their target, or completion date, was 17 August, so they had time enough in hand to make it.

Action

Into action again on 15 July to insert the regenerators, and to monitor each of the thirty-six points in

turn for error-free reception. Hugh and John started from opposite ends this time, with Sid and Brian co-operating at the terminals.

They had one of the worst spells of wet weather in this the wettest summer in the south-east for years. 'Working under plastic sheets at track-side boxes with the trains roaring by and soaking our electrical gear was just like being on a battle course

ABOVE: Her Majesty the Queen in the new power signal-box at Euston. The station area, in common with electrified routes, has been completely refitted with multiple-aspect colour-light signalling. The auto-manual telephone exchange in this building is British Rail's largest with a capacity of 3,000 lines serving departments in the London area and providing trunk dialling facilities to main Region centres. The new Marconi PCM link is part of the system

RIGHT: The new signal and telecommunications building at Euston. It replaced four signal boxes





One of the new arrival platforms. Over 30,000 passengers use this terminus daily. There are now 18 platforms altogether, three of which are used for parcels traffic

again,' Hugh said, 'the nearest thing since 1940.'

Two way contact was established at 2 p.m. on 25 July. Then British Rail's Paul Cheshire, whose enthusiasm for Marconi P.C.M. contributed to the success of this project, joined Hugh and together they carried out a visual check of every piece of

equipment in the circuit. In doing so they must have trudged nearly every mile of the track.

Acceptance tests took place between 5 and 9 August, and, with traffic changeover on 10 and 11 August, the final handover was made on the 13th with four days in hand.



A new M.I. Attenuator, TF 2163, with a range of 0-142 dB, is in production. Chris Spooner, foreman, Attenuator Group, making a preliminary check on v.s.w.r. in the screened room. Another new attenuator is the TF 2163/M2 programmable version which is a considerable advance in remote operated attenuators

Thanks

THE LONGACRES canteen is looking very pleasant in its new colour scheme and the M.I. Social and Sports Club would like to thank the Buildings and Facilities Group for changing their decorating programme so that the canteen could be completed before the start of the new social season.

Painting the canteen is only part of a major programme instituted by F. H. Jenner, Manufacturing Services Manager, and J. K. Colthorpe, Chief of Buildings and Facilities, for gradual redecoration of the Longacres site. Other activities to improve the general amenities include the levelling, grass seeding and planting of rose bushes on the ground at the rear of the Assembly/Test building.

With the purchase of the old Ballito stocking factory M.I. inherited three large process steam boilers manually fired. In the interim period before complete occupation of the site, an English Electric mobile automatic boiler has been hired to provide sufficient steam to meet the heating requirements.